CHEMISTRY MAJOR

The major is recommended for students planning careers in chemistry. It is suitable preparation for graduate study in chemistry or medical school and for work as a professional chemist. The curriculum includes related courses in mathematics and physics as well as core courses and a concentration in chemistry.

Students must also complete the Undergraduate Registration Requirement (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/requirements-policies/undergraduate-registration-requirement/) and the degree requirements of their home school.

Course Title

Department Courses (16.68–17.68 units)

14.68–15.68 core units providing a solid basis in chemistry

CHEM 110-0 Quantitative Problem Solving in Chemistry
& CHEM 131-0 and General Chemistry 1
& CHEM 141-0 and General Chemistry Laboratory 1
& CHEM 152-0 and General Chemistry 2
& CHEM 142-0 and General Chemistry Laboratory 2
or CHEM 151-0 Accelerated General Chemistry 1
& CHEM 161-0 and Accelerated General Chemistry Laboratory 1
& CHEM 152-0 and Accelerated General Chemistry 2
& CHEM 162-0 and Accelerated General Chemistry Laboratory 2
or CHEM 171-0 Advanced General Inorganic Chemistry
& CHEM 181-0 and Advanced General Inorganic Chemistry
& CHEM 172-0 Laboratory
& CHEM 182-0 and Advanced General Physical Chemistry
& CHEM 173-0 and Advanced General Physical Chemistry Laboratory

CHEM 220-0 Introductory Instrumental Analysis

CHEM 210-1 Organic Chemistry
& CHEM 211-2 and Organic Chemistry
& CHEM 211-3 and Organic Chemistry
& CHEM 230-2 and Organic Chemistry Lab I
& CHEM 230-3 and Organic Chemistry Lab II
or CHEM 212-1 Organic Chemistry
& CHEM 212-2 and Organic Chemistry
& CHEM 212-3 and Organic Chemistry
& CHEM 232-1 and Organic Chemistry Laboratory I
& CHEM 232-2 and Organic Chemistry Laboratory II

CHEM 333-0 Inorganic Chemistry

CHEM 342-1 Thermodynamics
& CHEM 342-2 and Quantum Mechanics and Spectroscopy
& CHEM 342-3 and Kinetics and Statistical Thermodynamics

CHEM 350-1 Advanced Laboratory 1
& CHEM 350-2 and Advanced Laboratory 2
& CHEM 350-3 and Advanced Laboratory 3

2 courses from one of these concentration areas:


Environmental Chemistry (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/arts-sciences/chemistry/chemistry-major/#environmental)

Inorganic Chemistry (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/arts-sciences/chemistry/chemistry-major/#inorganic)


Physical Chemistry (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/arts-sciences/chemistry/chemistry-major/#physical)

Concentration Courses

• Areas of concentration draw upon courses within the department as well as in other departments.

• Concentration courses are typically taken during the final year of undergraduate study.

• The concentration areas, along with eligible courses, are:

Biochemistry

Course Title

CHEM 305-0 Chemistry of Life Processes
CHEM 314-0 Bioorganic Chemistry
CHEM 316-0 Medicinal Chemistry: the Organic Chemistry of Drug Design and Action
CHEM 329-0 Analytical Chemistry
CHEM 415-0 Advanced Organic Chemistry


Self-designed Concentration (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/arts-sciences/chemistry/chemistry-major/#selfdesigned)

Related Courses (Units depend on mathematics courses taken.)

BIOL_SCI 301-0 Principles of Biochemistry
or BIOL_SCI 241-0 Biochemistry for ISP

MATH 220-1 Single-Variable Differential Calculus
& MATH 220-2 and Single-Variable Integral Calculus
or MATH 218-1 Single-Variable Calculus with Precalculus
&MATH 218-2 and Single-Variable Calculus with Precalculus
&MATH 218-3 and Single-Variable Calculus with Precalculus

MATH 230-1 Multivariable Differential Calculus
& MATH 230-2 and Multivariable Integral Calculus
or MATH 281-1 Accelerated Mathematics for ISP First Year
&MATH 281-2 and Accelerated Mathematics for ISP First Year
or MATH 285-2 Accelerated Mathematics for MMSS: First Year
&MATH 285-3 and Accelerated Mathematics for MMSS: First Year
or MATH 290-2 MENU: Linear Algebra and Multivariable Calculus
&MATH 290-3 and MENU: Linear Algebra and Multivariable Calculus
or MATH 291-2 MENU: Intensive Linear Algebra and Multivariable Calculus
&MATH 291-3 and MENU: Intensive Linear Algebra and Multivariable Calculus

PHYSICS 125-1 General Physics ISP
& PHYSICS 125-2 and General Physics for ISP
& PHYSICS 125-3 and General Physics for ISP
& PHYSICS 126-1 and Physics for ISP Laboratory
& PHYSICS 126-2 and Physics for ISP Laboratory
&MATH 126-3 and Physics for ISP Laboratory

or PHYSICS 135-1 General Physics
&MATH 135-2 and General Physics
&MATH 135-3 and General Physics
&MATH 136-1 and General Physics Laboratory
&MATH 136-2 and General Physics Laboratory
&MATH 136-3 and General Physics Laboratory
or PHYSICS 140-1 Fundamentals of Physics
& PHYSICS 140-2 and Fundamentals of Physics
& PHYSICS 140-3 and Fundamentals of Physics
&MATH 140-5 and General Physics Laboratory
&MATH 140-6 and General Physics Laboratory
&MATH 140-7 and General Physics Laboratory
&MATH 140-8 and General Physics Laboratory
&MATH 140-9 and General Physics Laboratory
&MATH 140-10 and General Physics Laboratory

Calculus
or MATH 218-1 Single-Variable Calculus with Precalculus
&MATH 218-2 and Single-Variable Calculus with Precalculus
&MATH 218-3 and Single-Variable Calculus with Precalculus

10/15/20
### Environmental Chemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHEM 306-0</td>
<td>Environmental Chemistry</td>
</tr>
<tr>
<td>CHEM 329-0</td>
<td>Analytical Chemistry</td>
</tr>
<tr>
<td>CHEM 393-0</td>
<td>Green Chemistry</td>
</tr>
<tr>
<td>CIV_ENV 260-0</td>
<td>Environmental Systems and Processes</td>
</tr>
<tr>
<td>CIV_ENV 314-0</td>
<td>Organic Geochemistry</td>
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<tr>
<td>CIV_ENV 365-0</td>
<td>Environmental Laboratory</td>
</tr>
<tr>
<td>CIV_ENV 367-0</td>
<td>Chemical Processes in Aquatic Systems</td>
</tr>
</tbody>
</table>

### Inorganic Chemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHEM 302-0</td>
<td>Principles of Inorganic Chemistry</td>
</tr>
<tr>
<td>CHEM 329-0</td>
<td>Analytical Chemistry</td>
</tr>
<tr>
<td>CHEM 411-0</td>
<td>Organic Spectroscopy</td>
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<tr>
<td>CHEM 432-0</td>
<td>X-Ray Crystallography</td>
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<tr>
<td>CHEM 433-0</td>
<td>Structural Inorganic Chemistry</td>
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<tr>
<td>CHEM 434-0</td>
<td>Inorganic Chemistry</td>
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<tr>
<td>CHEM 435-0</td>
<td>Advanced Inorganic Chemistry</td>
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### Organic Chemistry

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CHEM 309-0</td>
<td>Polymer Chemistry</td>
</tr>
<tr>
<td>CHEM 313-0</td>
<td>Advanced Organic Chemistry 1. Advanced concepts of organic reactivity and selectivity in synthesis.</td>
</tr>
<tr>
<td>CHEM 314-0</td>
<td>Bioorganic Chemistry</td>
</tr>
<tr>
<td>CHEM 316-0</td>
<td>Medicinal Chemistry: the Organic Chemistry of Drug Design and Action</td>
</tr>
<tr>
<td>CHEM 319-0</td>
<td>Advanced Organic Synthesis - Concepts and Applications</td>
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<tr>
<td>CHEM 329-0</td>
<td>Analytical Chemistry</td>
</tr>
<tr>
<td>CHEM 410-0</td>
<td>Physical Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 412-0</td>
<td>Organometallic Reaction Mechanisms</td>
</tr>
<tr>
<td>CHEM 414-0</td>
<td>Advanced Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 415-0</td>
<td>Advanced Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 418-0</td>
<td>Organometallic Chemistry and Homogeneous Catalysis</td>
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### Physical Chemistry

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CHEM 303-0</td>
<td>Principles of Physical Chemistry</td>
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<tr>
<td>CHEM 329-0</td>
<td>Analytical Chemistry</td>
</tr>
<tr>
<td>CHEM 442-1</td>
<td>Quantum Chemistry</td>
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<tr>
<td>CHEM 442-2</td>
<td>Quantum Chemistry</td>
</tr>
<tr>
<td>CHEM 443-0</td>
<td>Kinetics</td>
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<tr>
<td>CHEM 444-0</td>
<td>Elementary Statistical Mechanics</td>
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<tr>
<td>CHEM 445-0</td>
<td>Advanced Physical &amp; Analytical Chemistry</td>
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<tr>
<td>CHEM 448-0</td>
<td>Computational Chemistry</td>
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</table>

### Materials/Nanotechnology

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHEM 307-0</td>
<td>Materials and Nanochemistry</td>
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<tr>
<td>CHEM 308-0</td>
<td>Design, Synthesis, and Applications of Nanomaterials</td>
</tr>
<tr>
<td>CHEM 309-0</td>
<td>Polymer Chemistry</td>
</tr>
<tr>
<td>CHEM 329-0</td>
<td>Analytical Chemistry</td>
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### Self-designed Concentration

If the concentrations above do not meet their interests, students may design a concentration with approval of the director of undergraduate studies in chemistry. A concentration may consist of 2 courses from the areas above or with a common theme.

### Honors in Chemistry

Majors who have done outstanding work in the classroom and research laboratory may be eligible for graduation with honors in chemistry. Students who intend to submit a senior thesis should send an e-mail message (including the name of the research adviser) to the director of undergraduate studies by fall of senior year. To be eligible for honors, a student must meet minimum GPA requirements, engage in original research during at least two quarters of CHEM 399-0 Independent Study, and write a senior thesis on this research. The CHEM 399-0 credits are not required for and do not count toward the chemistry major.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies and see Honors in the Major (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/arts-sciences/#academicoptionstext).

### Honors Program in Medical Education Students

Chemistry majors who are also participating in the HPME program (https://catalogs.northwestern.edu/archives/2019-2020/undergraduate/dual-graduate-undergraduate-degrees/honors-program-medical-education/) are permitted two waivers in their major. Only one of these waivers may be used for a core program course; the second waiver may be used for a concentration course.